

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A wiring structure wherein the wiring structure is so constituted that, in a wiring structure of multi-layered wiring in which a plurality of unit wiring structures are laminated, the unit wiring structure having at least one metal wiring and at least one metal connection plug formed by filling the metal into a wiring trench and a via hole formed in an insulation film on a substrate forming a semiconductor element,

at least one of the unit wiring structures includes an insulation barrier layer with organic substance inserted between at least one of the metal wiring and the metal connection plug, and an interlayer insulation film,

at least a portion of a side surface of at least one of the metal wiring and the metal connection plug being overlaid by the insulation barrier layer;

wherein an interlayer insulation film in which a first insulation film, a third insulation film, ~~a fourth insulation film~~, a porous insulation film and a second insulation film are laminated in series, is formed on the metal wiring, a side surface of a wiring trench formed through at least the second insulation film and the porous insulation film, and a side surface of a via hole formed through ~~the fourth insulation film~~ and the third insulation film being overlaid by the insulation barrier layer including the organic substance, and carbon content of the organic substance being larger than that of the first insulation film, and the second insulation film ~~and the fourth insulation film~~,

wherein the insulation barrier layer including the organic substance includes silicon atoms in a range smaller than the carbon content of the first insulation film and the second insulation film by atm %.

2. (original): The wiring structure according to the claim 1 wherein said insulation barrier layer further includes silicon atoms.

3. (previously presented): The wiring structure according to the claim 1 wherein said metal is copper, said metal wiring is a copper wiring, and said metal connection plug is a copper connection plug.

4. (previously presented): The wiring structure according to the claim 3 wherein the interlayer insulation film is formed on at least one of the copper connection plug, at least a portion of a side surface of at least one of a wiring trench and a via hole formed through the first insulation film, the porous insulation film and the second insulation film being overlaid by the insulation barrier layer including the organic substance.

5. (canceled).

6. (previously presented): The wiring structure according to claim 1 or claim 4 wherein the porous insulation film is made of a porous film having relative dielectric constant no greater than 3.0.

7. (previously presented): The wiring structure according to either one of claims 1 and 4 wherein the insulation barrier layer further includes silicon atoms.

8. (canceled).

9. (currently amended): The wiring structure according to claim ~~1~~24 wherein the third insulation film and the fourth insulation film are made of the same material.

10. (previously presented): The wiring structure according to any of claims 1, 2, or 4, wherein the insulation barrier layer including the organic substance is made of organic substance including Si-O binding.

11. (previously presented): The wiring structure according to any of claims 1, 2, or 4, wherein the insulation barrier layer including the organic substance is made of organic substance including Silicon in the range of 1 atm % to 10 atm %.

12. (previously presented): The wiring structure according to any of claims 1, 2, or 4, wherein the insulation barrier layer including the organic substance is made of a Divinyl Siloxane Benzo Cyclobutene film.

13. (canceled).

14. (currently amended): A wiring structure wherein the wiring structure is so constituted that, in a wiring structure of multi-layered wiring in which a plurality of unit wiring structures are laminated, the unit wiring structure having at least one metal wiring and at least one metal connection plug formed by filling the metal into a wiring trench and a via hole formed in an insulation film on a substrate forming a semiconductor element,

at least one of the unit wiring structures includes an insulation barrier layer with organic substance inserted between at least one of the metal wiring and the metal connection plug, and an interlayer insulation film,

at least a portion of a side surface of at least one of the metal wiring and the metal connection plug being overlaid by the insulation barrier layer;

wherein an interlayer insulation film in which a first insulation film, a third insulation film, ~~a fourth insulation film~~, a porous insulation film and a second insulation film are laminated in series, is formed on the metal wiring, a side surface of a wiring trench formed through at least the second insulation film and the porous insulation film, and a side surface of a via hole formed through ~~the fourth insulation film and the third insulation film~~ being overlaid by the insulation barrier layer including the organic substance, and carbon content of the organic substance being larger than that of the first insulation film, and the second insulation film ~~and the fourth insulation film~~,

wherein the insulation barrier layer including the organic substance is made of a film of Divinyl Siloxane Benzo Cyclobutene, the first insulation film is made of a SiCN film, the second insulation film is made of a SiO₂ film, the porous insulation film is made of a porous SiOCH film, and the third insulation film is made of a porous SiOCH film.

15. (currently amended): A wiring structure wherein the wiring structure is so constituted that, in a wiring structure of multi-layered wiring in which a plurality of unit wiring structures are laminated, the unit wiring structure having at least one metal wiring and at least one metal connection plug formed by filling the metal into a wiring trench and a via hole formed in an insulation film on a substrate forming a semiconductor element,

at least one of the unit wiring structures includes an insulation barrier layer with organic substance inserted between at least one of the metal wiring and the metal connection plug, and an interlayer insulation film,

at least a portion of a side surface of at least one of the metal wiring and the metal connection plug being overlaid by the insulation barrier layer;

wherein an interlayer insulation film in which a first insulation film, a third insulation film, ~~a fourth insulation film~~, a porous insulation film and a second insulation film are laminated in series, is formed on the metal wiring, a side surface of a wiring trench formed through at least the second insulation film and the porous insulation film, and a side surface of a via hole formed through ~~the fourth insulation film~~ and the third insulation film being overlaid by the insulation barrier layer including the organic substance, and carbon content of the organic substance being larger than that of the first insulation film, and the second insulation film ~~and the fourth insulation film~~,

wherein the insulation barrier layer including the organic substance is made of a film of Divinyl Siloxane Benzo Cyclobutene, the first insulation film is made of a SiCN film, the second insulation film is made of a SiO₂ film, the porous insulation film is made of a porous SiOCH film, and the third insulation film is made of a nonporous SiOCH film.

16. (previously presented): The wiring structure according to any of claims 1, 2, 4, or 14-15 wherein the insulation barrier layer including the organic substance is made of carbon, silicon and organic substance.

17. (previously presented): The wiring structure according to claim 1 or claim 4 wherein both of the first insulation film and the second insulation film are made of the same material.

18. (previously presented): The wiring structure according to claim 1 or claim 4 wherein both of the first insulation film and the second insulation film are made of the same material, and made of either one of SiCN, SiC, SiCNH, SiCH and SiOCH.

19-23. (canceled).

24. (currently amended): The wiring structure according to claim 1,
wherein the interlayer insulation film further includes a fourth insulation film laminated in series after the third insulation film and before the porous insulation film,
wherein the via hole formed in the interlayer insulation film is formed through the fourth insulation film and the third insulation film,
wherein the carbon content of the organic substance is larger than that of the fourth insulation film,

wherein the insulation barrier layer including the organic substance includes silicon atoms in a range smaller than the carbon content of the fourth insulation film by atm %.

25. (currently amended): The wiring structure according to claim 14,
wherein the interlayer insulation film further includes a fourth insulation film laminated
in series after the third insulation film and before the porous insulation film,
wherein the via hole formed in the interlayer insulation film is formed through the fourth
insulation film and the third insulation film,
wherein the carbon content of the organic substance is larger than that of the fourth
insulation film,
wherein the fourth insulation film is made of a SiO₂ film.

26. (currently amended): The wiring structure according to claim 15,
wherein the interlayer insulation film further includes a fourth insulation film laminated
in series after the third insulation film and before the porous insulation film,
wherein the via hole formed in the interlayer insulation film is formed through the fourth
insulation film and the third insulation film,
wherein the carbon content of the organic substance is larger than that of the fourth
insulation film,
wherein the fourth insulation film is made of a SiO₂ film.